# Public Attitudes Toward Geological Disposal of Carbon Dioxide in Canada

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# Introduction

- Canada must rapidly reduce its GHG emissions under the Kyoto Protocol, but currently derives 70% of its energy from fossil fuels
- One solution: capture $CO_2$ from power or industrial plants and dispose of it in geological formations – Geological Disposal of Carbon Dioxide (GDC)
- Will this be publicly acceptable?

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# Methodologies

1. Focus Groups: Toronto & Edmonton
2. National Survey
3. Analysis
    1. Qualitative and descriptive statistics
    2. Discrete choice experiment
    3. Linear multiple regression

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# Key Results

- Climate change was the second lowest ranked national issue in terms of importance, and the lowest ranked environmental issue
- 70 - 80% of the public still supported at least some action to address climate change
- 10 – 15% of the public has heard of GDC (but they can't identify what environmental problem it addresses)

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# Survey Results

## Ranking of Benefits

1. Bridging technology
2. Increase oil and gas production and reduce water use as part of Enhanced Oil Recovery
3. Reduce emissions faster and cheaper than alternatives
4. Allow continued fossil fuel use without a climate impact
5. Reduce emissions without requiring lifestyle changes *(only considered a very slight benefit)*

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# Survey Results

## Ranking of Concerns

1. Unknown future impacts
2. Contamination of groundwater
3. Safety risks of a $CO_2$ leak
4. Harm to plants and animals near the disposal site and underground
5. Wrong solution to climate change (prefer renewable energy and conservation)

→ Concerns more important than benefits

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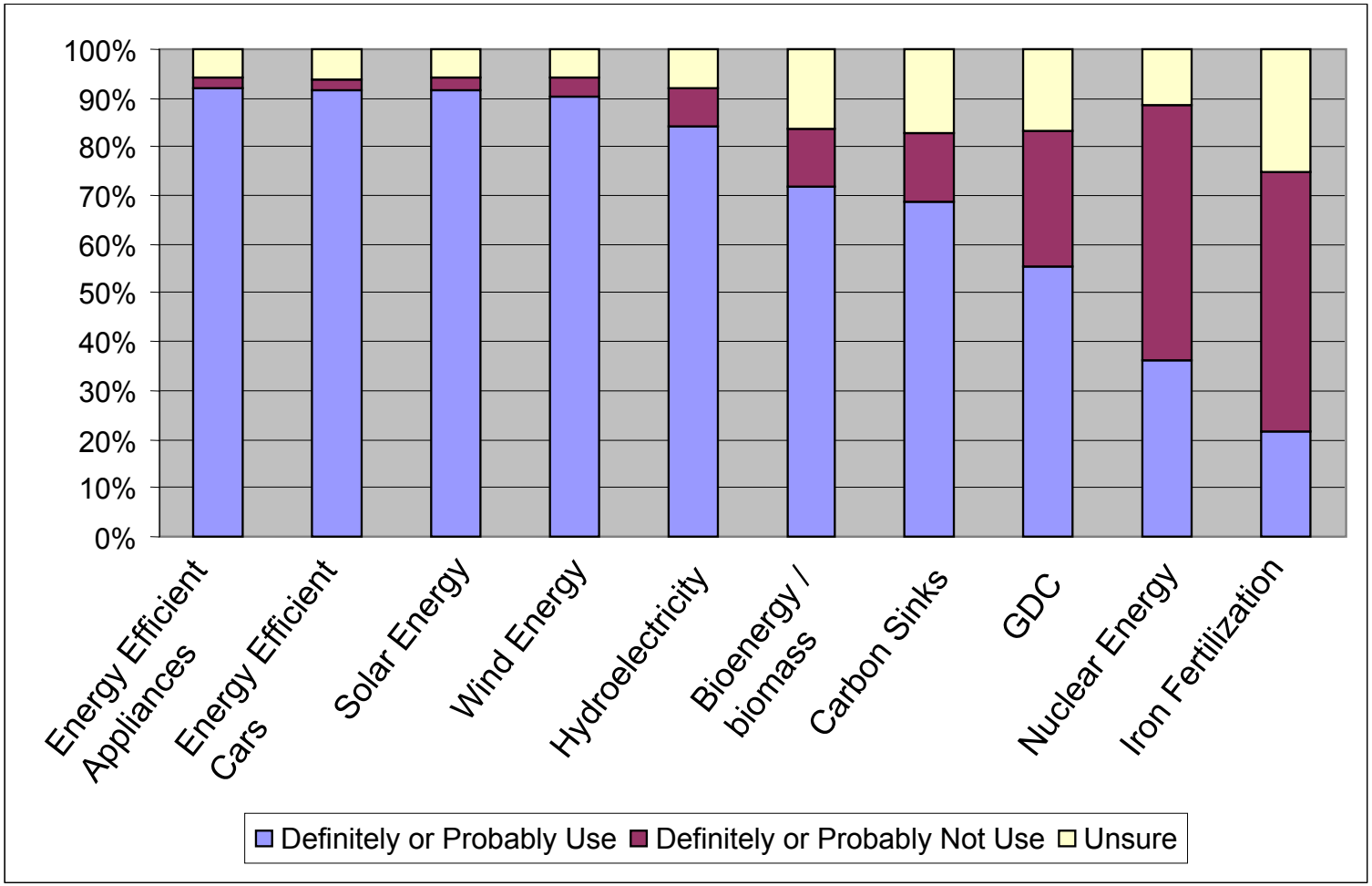
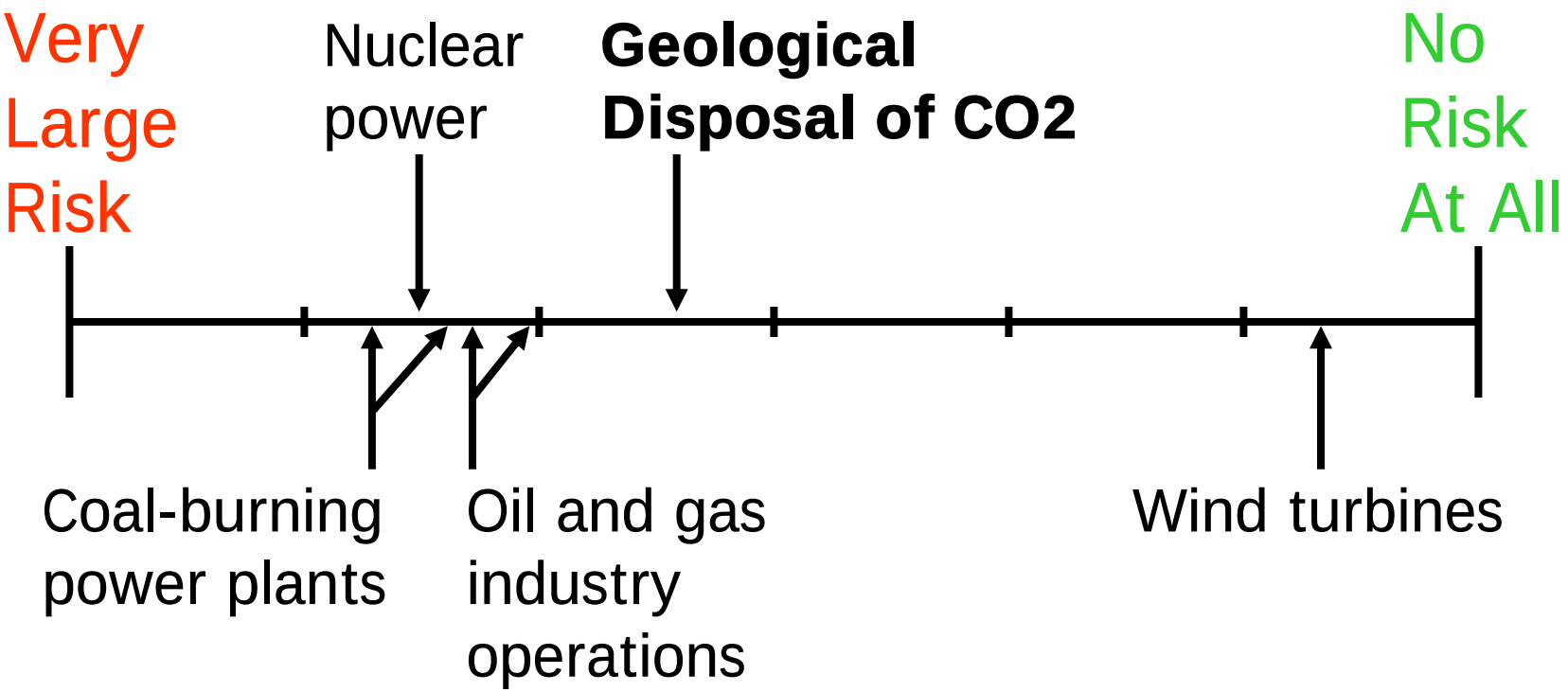
# Survey Results

## Energy Technologies that Respondents Would Use in a Climate Change Strategy



# Survey Results

## Perceived Risk Compared to Other Energy Technologies




Diagonal lines indicate different AB/SK ratings

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# Survey Results
## Overall Support for GDC

- Overall, respondents thought GDC would have a slightly positive net impact on the environment

- Both samples were slightly supportive of GDC development in Canada

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# Survey Results

## What Type of Opposition to GDC Exists?

- Respondents who were opposed to geological disposal of $CO_2$
  1. Moderately agreed that they were concerned about the risks
  2. Very slightly disagreed that they were fundamentally opposed to it

→ GDC does not face the same fundamental opposition as technologies such as nuclear power

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# Survey Results

## What Would Reduce Opposition to GDC?

1. More information (80% Can/77% AB/SK)
2. Involvement of independent experts and NGOs (63/58%)
3. No reduction in spending on renewable energy and energy efficiency (63/61%)
4. Strong regulation and monitoring (61/63%)

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# Discrete Choice Experiment:
## Modelling Theory

- $U_j = V_j + \varepsilon_j$
  - Utility of a product 'j' is comprised of observable and non-observable components

- $V_{GDC} = \beta_{GDC} + \beta1*Entity_{GDC} + \beta2*Share_{GDC} + \beta3*ElecBill_{GDC}$
  - Observable utility is a weighted sum of the characteristics of GDC and the importance of each characteristic

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# Discrete Choice Experiment:
## Results

- The experiment forced respondents to make 9 choices between alternative GDC configurations - tradeoffs
- Most important characteristic: managing entity
  - Federal or provincial government preferred
  - Industry management associated with loss of public welfare
- Increasing the share of GHG reduction targets met with GDC (versus renewables, efficiency, and nuclear) increases welfare
- Explanatory power low: $R^2 = 0.1512 / 0.1429$

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# Multiple Regression Theory

- Question: Can attitudinal and socio-demographic variables be used to predict support for GDC?
- $Y = a + b_1X_1 + b_2X_2 + b_3X_3 \ldots + b_xX_x$
- Support for GDC = f (climate change beliefs, awareness of GDC, certainty about rated GDC support, gender, age, income, education, province, city size, children)

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# Multiple Regression Results

- $R^2$ = 0.032 (CAN) / 0.098 (AB/SK) – very low explanatory power – most of the variability in responses is coming from other sources or is random
- Significant determinants of support for GDC likely do not yet exist
- However…results suggest support for GDC will be proportional to belief in climate change, and females are less likely to support GDC

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# Policy Recommendations

GDC will likely be publicly acceptable in Canada, but requires the following:

1. More public education about climate change
2. Public outreach about GDC
3. GDC as a bridging solution, not a ‘silver bullet’
4. Proactive involvement of the media
5. Federal and provincial gov’t involvement
6. Independent expert/NGO involvement
7. Enough GDC to be “worth the effort”

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# International Attitudes Toward GDC

- The Netherlands: Slightly positive in general, slightly negative when near their neighbourhoods
- The UK: Slight support, but must be used in combination with renewables and efficiency
- United States: Somewhat opposed to GDC
- Japan:  Slight support for the concept, but slight opposition in practice

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# Conclusions

- Public attitudes toward GDC are slightly positive
- GDC is perceived to be less risky than other energy technologies that are accepted by Canadians
- A number of actions can be taken by government and industry to increase public support
- GDC should be publicly and politically acceptable on a large scale

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